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ABSTRACT

Egypt is having a very difficult time supplying enough food to meet the demands of its swelling population. This complex problem is analyzed and discussed from a variety of perspectives. Factors such as foreign aid, family planning, agriculture, demographics, and religious and social culture are examined, as well as more specific issues such as food versus cash crops, desert development, productive capacity, hydroponics, and state capitalism. Intended to provide background information for a social studies unit on Egypt, the material may be useful in high school economics or global studies classes. (DB)

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Science, Technology and Society in Contemporary Egypt: Background Information for Social Studies Teachers

by

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Fulbright-Hays Seminar in Egypt

Summer 1989

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Forward

Social studies units on Egypt tend to be presented from a historical perspective. The Pharaonic Period was colorful and romantic. The artifacts retreived from the tombs of pharaohs provide concrete objects that can be replicated by young children. The Sphinx and the Great Pyramids remain shrouded in mystery. Such a unit has built-in appeal. Unfortunately, staging frequently exceeds substantive content or contemporary relevance.

The volume of U.S. aide provided to Egypt (Misr) is second only to that given to Israel. Our level of commitment has little or nothing to do with the content of the afore mentioned social studies units. Egypt's strategic location and political alignments are critical to world security. However, Egypt is faced with a number of interrelated issues that are critical to its very existence. Formost among Egypt's problems is the inability to produce enough food to feed its expanding human population. This dilemma involves the interfacing of science, technology, and the full array of social disciplines.

The content of this paper is drawn from a wide variety of sources, many of which are not available to most social studies teachers. The issues that have been identified are within the range of understanding for most upper elementary students. Although it probably makes sense to introduce concepts such as "carrying capacity" and "over consumption" in the primary grades.

Teachers are cautioned to continually up-date statistical data. A recently published travel guide indicates that the population of Cairo

is a little over five million people, yet, population estimates in the summer of 1989 were closer to fifteen million.

If education is seen as the means to upward mobility, and Egypt has free public education through the college level, why is half of the population illiterate and living in poverty?

If Egypt can't grov enough food to feed its groving population, vhy isn,t there a greater effort to regulate the volume of new births?

Will improved health services increase or decrease the size of Egyptian families?

The questions one could ask about Egyptian culture seem endless. It is the possible solutions that tax logical thought and collective wisdom.

EGYPT: POPULATION, FOOD AND DIFFICULT CHOICES

An increasing number of countries throughout the world, particularly those in arid or semi-arid regions, are unable to produce enough food for their rapidly expanding populations. As population increases, there is a proportionate increase in the demand for food since people do not voluntarily adjust their diets because of limited agricultural production capacity. When the demand for food exceeds the carrying capacity of land, greater demands are placed on productive soil in an effort to maximize yields, while food supplies are supplemented with imports. In recent years, the use of improved varieties of seed, in concert with heavy applications of synthetic fertilizers, have resulted in short-term food gains, but at the cost of long-term deterioration of soil substance. Extensive use of chemical fertilizers, herbicides and pesticides reduce the organic content of soil resulting in loss of fertility and ease of erodibility.[1] The entire network represents a downward spiral that accommodates immediate profits over long-term sustainability. In addition to the biological factors of this network, there is the social phenomenon of 'urban drift' which further complicates the population/food ratio by reducing the volume of existing agricultural land.

Egypt is a case in point. The country's economic problems have, to a great extent, been the result of an expanding population of 54 million people coupled with 30-year-old socialist policies that have placed an emphasis on consumption rather than conservation.[2] During the 1970s Egypt was self-sufficient in food production. There was a balance between farm output and the consumption rate of Egypt's human

population. However, in the latter portion of the 1980s, the national government has imported more than half of the country's basic foodstuffs. When the purchase of food is calculated with other subsidized commodities, Egypt's capital outlay has been approximately $3 billion a year.[3]

According to Dale and Carter[4], food supply has always been the first measure of a nation's strength. In recent years, grain reserves, particularly wheat, corn and rice, have been useful indicators of food security.[5] There is, consequently, cause for alarm when, as in 1986 and 1988, the world's grain stocks dropped below the estimated safety level.[6] It has been assumed that grain harvests in "good" years will compensate for periods of insufficient production, but that has not been the case in recent history. Each year, without falter, the world's population increases at the rate of approximately 88 million children. Consequently, there is a sustained modification in the ratio between production and consumption. Such a global pattern clearly effects the quantity of grain available to Egypt. Fisher [7] reports that Egypt's consumption of wheat has increased by 56 percent since 1960, rather than decrease in response to the drop in world grain reserves. At such a rate of use, the country's production of wheat cannot meet annual consumption requirements, let alone contribute to a reserve.

Food dependence is further complicated by the government's inability to generate foreign exchange earnings to offset the cost of imported commodities. Wheat and flour obtained from the United States and European countries are usually acquired on credit, however, 200,000 tons of wheat were recently purchased on the open market. This is the

first time in recent history that Egypt has had to pay cash for wheat.[8]

Because 99 percent of all Egyptians live along the Nile River and Suez Canal, which accounts for 5 percent of the country's total surface area, there is considerable competition for available land. The Nile flood plain, particularly in Middle Egypt, is composed of very fertile soil, while the extended Nile complex constitutes the bulk of Egypt's agricultural land. Unfortunately, this rich, level land adjacent to the country's primary source of usable water is also the most desirable area for urban development. It is estimated that urban drift, leading to the unplanned and uncontrolled sprawl of the cities' margins, has taken 40 thousand acres of agricultural land out of production. This means that the remaining arable land is placed under greater stress. Despite such an adverse condition, Egypt's food production is increasing at approximately 2 percent a year, primarily as a result of intensified use of chemicals and/or placing marginal or new land into production. Using hundreds of grams of plant nutrient per hectare of arable land as the standard of measure, Egypt has increased it's fertilizer consumption from 1,282 in 1970 to 3,473 in 1985.[9] It should be noted, however, that the 2 percent increase in food production is offset by a 5 percent annual increase in consumption.[10]

Cairo is a prime example of urban sprawl. It is not only the capital of Egypt, but also the cultural hub of the Islamic world. The city serves as a magnet for migrating groups who frequently establish alternative settlements wherever they can, and under whatever conditions exist. The propagation of established Cairenes, coupled with migrants, has resulted in a metropolitan population of approximately 14 million people. (Note: Any statistic relating to

human populations in Egypt should be considered suspect data in that accounting procedures are unreliable.) With such a expanding population, housing is at a premium. Once desirable housing is obtained, it is passed from one family member to another. The need for more living space leads to uncontrolled expansion of the cities parameters. Urban sprawl frequently takes the form of movement away from the center of the city by gradually adding to the outer margins.

However, a different pattern, that might be called the 'corridor effect,' can be found on the western edge of Cairo between el Giza and the Great Pyramids. In this case, a suburb and a tourist attraction are connected by four-lane, paved roads. Under such conditions, there is a tendency to fill-in the space along the corridor with commerical and residential development. Unfortunately, the space in question is some of Egypt's most productive agricultural land. As one travels the Al-Ahram, for example, new concrete high-rises are intermittently gaped by agricultural plots and grazing livestock. This visual example provides clear evidence of urban expansion infringing on prime arable land. Swanson[11] predicts that within the near future the Great Pyramids of Giza, currently on the fringe of the Western Desert, will become a cultural oasis surrounded by urban expansion.

As knowledge of Egypt's social and economic life broadens and interrelationships emerge, it becomes increasingly apparent that the population/food dilemma is truly a complex issue having no quick or easy solutions. There are far too many interconnected relationships occurring simultaneously to enable the identification of simple feedback loops. As a result, public and private decision makers are confronted with difficult choices that tax their sense of certainty. Corrective measures, if they are to be found, are likely to be drawn

from one or more of the following categories:

(1) Population control,

(2) An increase in the productive capacity of existing agricultural land,

(3) An adjustment in the ratio of food to cash crops,

(4) Desert community development

(5) The development of hydroponics.

(6) A restructuring of the central government.

HUMAN POPULATION

By guaranteeing a constant supply of food, the Egyptian government is actually underwriting population growth. Subsidies provide basic food security, therefore, fear of starvation is not a motivating force in Egyptian society. In theory, a reduction in the availability of subsidized food could serve to regulate population volume by depleting the ranks of those having the least amount of purchasing power. Although such a policy may follow Neo-Darwinian principles, people react differently than animals in the bush.

In 1976, Egypt started to eliminate food subsidies in response to pressure from the International Monetary Fund to rationalize its economy. Egyptian citizens responded with the Food Riots of 1977. Confrontations between rioters and government forces resulted in 73 deaths, 800 injuries, and the maintenance of subsidies.[12] The government obtained social tranquility at the cost of economic stability. Farah[13] reported that basic subsidies, mostly bread, would be reduced or eliminated beginning July 1989. It is difficult to determine, at this time, the extent to which the government will

actually implement a severe reduction in food subsidies. It would also be highly speculative to predict the reactions of the people should the reductions occur. Social history indicates, however, that Egyptians have a high level of tolerance and are slow to display civil disobedience.

The number of people living within Egypt's borders could be modified through immigration or migration. This has been the case, for limited periods of time, because Egypt has been a labor-exporting country. Better job opportunities in oil-producing areas, such as the Gulf States and Libya, accounted for 3.28 million Egyptians working abroad in 1983.[4] Exportation of labor helped to reduce unemployment within Egypt's borders, and also provided an increase in foreign exchange earnings because migrant workers sent money to their families who remained at home. There were two additional benefits to be derived from members of the work force migrating to other countries. When men were out of the country they were not eating Egyptian food nor were they impregnating Egyptian women. However, the major benefits derived from Egypt's migratory work force has been short lived. In 1985, as a result of political tension, Libya expelled 5,000 Egyptians. In addition, Iraq's decision to restrict the amount of money that migrant workers could send home resulted in 250,000 Egyptians leaving the country.

There has also been a change in the composition of Egypt's migratory work force. In the early 1980s, The Gulf States were engaged in a rapid expansion of their infrastructures. Consequently, there was a job market for unskilled laborers, particularly in the construction business. Now that major expansion has been completed, the labor needs of the Gulf States have been limited to professional and technical

fields. Selective exportation of labor has tended to have a negative impact on the growth rate of Egypt's economy. The current domestic unemployment rate is over 20 percent and the job market cannot absorb the annual pool of 450,000 potential young workers.[15]

If a reduction in population is not feasible, barring an unforseen catastrophe, the next best option is to seek zero population growth by stabilizing the birth rate. The ratio of Egypt's births to deaths in 1986 was 34:10 per thousand population.[16] Between 1965 and 1986 the rate of births decreased by 20 percent while the decrease in deaths was 47 percent. There would have to be a considerably greater decrease in birth rates to offset the influence of longevity. Such a reduction would be possible without significantly altering existing family structures since, in 1987, the average number of children per Egyptian woman was 5.3.[17]

Part of Egypt's foreign-aid package consists of over $67 million from the United States to assist in the development of a family planning program.[18] In addition to money and personnel, large quantities of condoms have been provided, yet only about one-third of the target population uses the device.[19] It is the urban, economically active women from the middle classes who are most likely to practice some from of birth control. The rural poor appears to be relatively uneffected by efforts to limit child production. It is difficult to envision authoritarian Egyptian males willfully using condoms since a large family is proof of the husband's virility and the cessation of pregnancies through birth control would probably be interpreted as a sign of impotence.[20] Social position within the community is extremely important to both Egyptian males and females, therefore, they

tend to avoid any condition that diminishes their status.

If an Egyptian woman was to engage in birth control without her husband's consent, the non-production of children would be grounds for divorce and/or the taking of another wife. The current personal status laws governing gender relations in marriage, divorce and custody of children do not adequately protect the welfare and rights of females .[21] Based on a recent survey, the human condition most feared by Egyptians is loneliness.[22] They desire to be surrounded by relatives and friends. Consequently, many Egyptian women find themselves caught in a "no win" life style. Egypt's failure to implement a comprehensive population control program is not based on the lack of resources, but rather social attitudes and beliefs that are rooted in tradition.

> The problem was not simply ignorance and suspicion of contraceptive methods, but also deep-rooted cultural practices. For most people in rural areas, a large family was a sign of status. More children meant greater security - more help working on the family's land or tending its animals, plus a greater likelihood of being cared for in old age.[23]

In the previous quote, Unger could be describing Egyptian society, but the statement happens to refer to Kenya's rural population. It is a pattern that is repeated throughout Africa, regardless of a group's religious beliefs.

During an audience with the Grand Sheik of El-Azhar,[24] the highest intellectual authority in the Islamic world, he was asked to remark about a women being elected as president of Pakistan (an Islamic state) and, more generally, about women in professional and leadership roles. The Sheik responded that successful female leaders have been exceptions rather than the rule and, therefore, do not merit consideration. He also stated that it is the role of women to manufacture and care for humankind. The official position of orthodox Islam, as stated by the

Grand Sheik, coupled with passages from the Qur'an such as: ____ sura 2, verse 223, "Your wives are a tilth. Go to your tilth as you will." and ____ sura 2, verse 187, "They are a garment for you and you are a garment for them. So hold intercourse with them and seek what God has ordained for you."[45] have led Westerners to believe that gender inequity in Egypt can be attributed to the tenets of Islam. However, it appears that El-Safti[46] is justified in stating that the differing social standards for men and women are a matter of tradition rather than religion. With regard to birth control, for example, religious leaders have not mounted a serious campaign in opposition to contraception, nor does there seem to be any absolute prohibition in Islamic law. In reality, inequitable gender roles predate Islam. Consequently, Islamic law complements rather than establishes the gender roles of Egyptian society.

Subsequent to Egypt's 1967 defeat by Israel, there has been a growing number of well-educated Egyptian men and women who have chosen to structure their lives around the Shari'a (Islamic law). The rationale for their choice is the belief that Egypt's failures can be attributed to the country's deviation from the "true way." The Western press would identify such people as "fundamentalist" (a term that is offensive to some Egyptians). Because the Shari'a is viewed by others as too restrictive for a changing, progressive society, those who regulate their lives in such a legislative manner are viewed as maladaptive. Farah[48] noted that fundamentalists see Islam as "the solution" without ever identifying the problem, or solution, in anything but abstract terms. Tahseen Basheer,[47] former Egyptian Ambassador to the Arab League, extended Farah's perspective by stating his belief that people who cannot adjust to the change and challenge of

current times retreat to an imagined existence of fundamentalist Islam.

Thus there is a conflict within Egypt's middle-class between those who tend to be more progressive and adaptable to change with those who identify with the Shari. It is unclear at this point in time, however, whether educated female fundamentalists are willing to limit their potential to "manufacturing humankind." However, their advocacy of conservative Islamic doctrine prevents the educated middle-class from presenting a united appeal for extending the rights of women. If such an appeal in forthcoming, it will have to originate with educated middle-class women.

Although the urban middle-class practice orthodox Islam, the vast majority of the rural population do not. The expansion of formal education to include more members of rural communities has led to shifting socio-religious pattterns. However, rural populations tend to practice a "popular religion" composed of beliefs and rites that predate Islam, and incorporate miracles, charms and magic, mixed with elements of Sufism and orthodox Islam.[8] Women are particularly prone to participate in the "dhikr", the Sufi ceremony of rememberence, in the belief that there is a direct relationship between such paticipation and the welfare of the family. [9] The elevated role of mysticism in village religious and daily life relieves both men and women of responsibility for birth control, since children are a gift from Allah that is not to be denied. Insha' allah! (If Allah wills).

It would seem that a government initiated program for zero population growth should be implemented in concert with the liberalization of personal status laws for women. Such a program would have to build upon the existing attitudes and beliefs of each

community. Neither men nor women should lose status, or rights, in such an arrangement. In fact, social status could be enhanced through public recognition and monetary incentives. At present the Mubarak administration's policy on population control appears to be one of relative inactivity, as opposed to the implementation of a dynamic program.

PRODUCTIVE CAPACITY

The annual flooding of the Nile River was responsible for silt and organic materials depositing layers of rich alluvial soil on Egypt's flood plain. Profiles indicate that in the first thousand years after Christ, approximately fifty inches of soil accumulated in the river valley. This means that the average annual deposit of alluvial fill was only one-twentieth of an inch. Such a small amount of soil would seem insignificant. However, Dale and Carter[30] maintain that had the deposit been larger the flood plain would have reached an elevation that would have prohibited flooding, thereby keeping hundreds of thousands of acres out of production. The flood residue was adequate to replace the nutrients lost to cropping. Organic material contained in the soil was particularly important because humus cannot accumulate in Egypt's warm climate.[31] Combined with the moisture of irrigation it decomposes quickly and is converted into living crops or oxidized.

There was a secondary benefit derived from the annual flood that has only been appreciated in recent years. As flood waters washed over the land, damaging salts were eliminated from the surface and carried downstream. The result was a replacement of salinity rather than an accumulation. Consequently, an Egyptian civilization based on agriculture, has been maintained for six thousand years because of a

relatively balanced ecosystem.

The first Aswan Dam was constructed in 1902, under the supervision of British engineers. It was reasoned that the ability to regulate the flow of the Nile throughout the year would result in maximum agricultural production. Such control would allow farmers to plant cotton, maize and sorghum in the summer; and wheat, beans, lentils, chickpeas and berseem in the winter. To compensate for loss of organic matter typically supplied by the annual flood, liberal applications of petrochemical fertilizers were used. Crop yields increased while the soil's volume of humus was systematically depleted. The reduction in humus was accelerated in fields devoted to large-scale cotton production since cotton leaves little organic matter in the soil.[32]

Following the completion of the High Dam at Aswan in 1971, new agricultural problems emerged. The continuous supply of water has led to a rise in the water table, extensive waterlogging of the soil and a marked increase in salinity. Salt will depress crop yields by retarding growth as a result of osmotic stress in soil/water/plant interactions.[33] It seems that in looking ahead to the benefits to be derived from the High Dam, insufficient attention was given to the potential negative effects of inadequate drainage systems. In addition to the gleying of soil there has been an increase in the occurrence of parasitic diseases such as bilharzia. The program of water release has also led to the growth of water hyacinth which has the potential of clogging irrigation systems.[34]

If Egyptian agriculture is limited to existing arable land, and current farming conditions, the soil's productive capacity may be close to its peak. Heavy use of synthetic fertilizers has already resulted in a 2 percent increase in agricultural output. However, fertilizers have

a maximum capacity to increase yields because there is an upper limit of photosynthetic efficiency.[35] Even though new variaties of fertilizers are continually being introduced, it is not reasonable to expect significant increases in agricultural production based solely on their use.

Improved methods of extracting contaminants from solids have revealed that resistant fractions of agricultural chemicals persist in the soil well beyond the period of time in which the substances should have degraded.[36] It has been determined that traces of chemicals secrete themselves into small chambers in the soil, called micropores. Fractions within the micropores are protected from degraders such as soil microbes and water molecules. The quantities of compounds that have been extracted from soil are significant, ranging from one half to 200 times the safe limit. In addition to volume, resistant fractions are maintained three to nineteen years beyond their projected life expectancy. The rate that agricultrual chemicals degrade varies considerably, depending on such factors as: temperature, organic content of the soil, level of bacterial activity, and the pH of the soil. Research on which the previous data are based was conducted in the United States; consequently it is difficult to determine the extent to which Egyptian soils are effected. However, since Egypt utilizes large quantities of pesticides and herbicides, many of which are known carcinogens, the quality of food becomes as much a factor of concern as the volume of production.

Legumes provide two to four times the protein of cereals and are frequently used as meat substitutes. When combined with cereals - such as in the rice and lentil dish mujaddarah - complementary amino acids, the primary building blocks of protein, are produced. In addition to

their food value, legumes are nitrogen-fixing plants and thereby fertilize the soil in which they grow, making them desirable elements in crop rotation programs. Because of their positive attributes legumes should be a major contributor to Egypt's basic food stock. In fact, lentils, chickpeas and faba beans are grown in Egypt, but unimproved varieties have suffered low and unreliable yields. The International Center for Agricultural Research in the Dry Areas located in Aleppo, Syria, has been cross breeding new varieties of legumes with the intent of improving their desirability as basic food crops. There has been particular success in developing faba beans that fertilize themselves and are more structurally secure. The Center has joined the Nile Valley Project in an effort to improve faba bean production in Egypt, Sudan and Ethiopia. Simarski[37] reports that one experimental area in Egypt has increased yields of 10-20% percent. Improved varieties of legumes, resulting from conventional cross-breeding techniques, hold considerable promise for increasing the food production capacity of existing arable soils and at the same time contribute to soil development.

Biotechnology is the field of science which uses genetically-altered organisms to improve the output of plants and animals. In theory, crops would be custom designed for particular environments which would enable them to grow under adverse conditions (i.e., insects, disease, aridity, etc.). The positive potential for agriculture is exciting and expectations are high, particularly the expectations of multinational chemical companies who are supporting and controlling most of the research in this area. With the promise of benefits, there are serious risks, such as: increased crop surpluses; soil depletion; increases in the type and amount of pollution; the loss

of small family farms; and, the most threatening risk, the releasing of mutant life forms.[18]

Researchers at Stanford University have developed a process that would make it possible to transfer cactus genes to wheat, thereby reducing the need for water. In Egypt, such a strand of wheat would markedly increase food production and decrease the need for imports. The major concern at this point is that each of the major chemical companies wants to "corner the market" for biotechnology, thereby increasing the possibility that products will be marketed before appropriate testing of their environmental impact. In his address to the Desert Development Seminar, February 15, 1989, Dr. Gerald Thomas[19] stated that "many of the ecological implications of agricultural development programs require more knowledge of complex ecosystems and a better understanding of the interaction among the physical, biological and climatic components." We are well advised to weigh short-term profits against the long-term effects of introducing genetically-altered products into the environment. The DuPont company advertised, "Better Living Through Chemistry." It's true that many humans have vastly improved lives as a result of product development within the chemical industry, but then there are the victims of Agent Orange.

FOOD vs CASH CROPS

One of the consequences of Egypt's 1952 Revolution was a series of land reforms. The first phase was primarily designed as an anti-feudal

measure to eliminate large estates and absentee ownership. Service cooperatives were formed to link small landholders and provide a support system. Membership in the cooperatives, however, was voluntary.

The second phase of reform occured in 1961, and was more consistent with socialist policy. The national government became the central regulating agency for agriculture. Farmers were required to form village cooperatives. It was the responsibility of the cooperative to regulate the distribution of such commodities as seed and fertilizer, as well as marketing crops. The government controlled the use of individual fields by imposing mandatory crop rotations on each village. Land ownership was limited to 100 feddans (1 feddan = 1.038 acres). In 1969, the third phase of land reform simply adjusted the size of an individual's holding from 100 to 50 feddans.[40] It should be noted, however, that there is considerable variation in the amount of land owned by individuals since new regulations tend not to be retroactive. For example, Tanner[41] made reference to the Mostafa's farm that was started by the patriarch of the family in 1961 with 250 acres (100 hectares or 259.5 feddans). This was during phase two of the land reform when the maximum land holding was supposed to be 100 feddans. Although land reform addressed accessive land ownership, in reality most farming in the Nile Valley was, and is, done by fellahin (poor peasants) who rent 3 to 5 feddans of land which are frequently located at more than one site around the village. This abbreviated chronology identifies a number of factors that influence the amount of each farmer's land which will be planted to food and/or cash crops.

Aside from physical parameters, such as climate and availibility of water, the two major factors influencing the ratio of food to cash

crops are: (1) the volume of land available for cultivation, and (2) a marketing system that is beyond the control of the farmer. The smallholder does not have the monetary resources to invest in modern agricultural technology. The machinery that is available in the Nile Valley is generally too large to be used in the fellahin's small fields; consequently, cultivation and harvesting are still accomplished with animals and by hand. Only remnants of the old subsistence economy can be found in the villages of the Nile.[12] Farmers now tend to sell the bulk of what they grow, and purchase most goods. This means that the smallholder must maximize the benefits to be derived from the land. In addition, the Egyptian government has a monopoly on the purchase of cotton and requires that yields of other crops, beyond set minimums, also be sold to the government. Unfortunately, the amount paid to the farmer is well below the free market price. Such a process generates income for the government, but makes it impossible for the small farmer to improve his condition. To compensate, farmers will try to grow crops that are not controlled by the government and, therefore, yield a greater monetary return. A case in point would be the cultivation of broccoli and asparagus. It would appear that these two vegetables are food crops; however, Egyptians don't particularly care to eat them. They are grown for sale to the luxury hotels in tourist centers. Therefore, the vegetables represent cash crops that are not controlled by the government.

Even though the farmer is able to avoid unfavorable marketing practices of the government he is still under the control of an exploitive system. The marketing process can be quite complex, involving transactions between a number of merchants. One of the most common marketing arrangements consists of the farmer selling his crop

to the village merchant, who sells to the regional middleman, who sells to the urban merchant. Hopkins[13] explains that one reason for the number of individuals involved in getting a crop from its origin to its final destination is that transactions are based on trust. Payment in currency is frequently delayed; consequently, the seller must trust the good faith of the buyer. The parties taking part in the exchange need to have had personal contact and know each other. The fellahin are likely to have difficulty following market prices and holding their crop until they can receive maximum profit. Rather than selling to the merchant at a desirable time, farmers are more apt to wait until the merchant is ready to buy their crop. Of course, the transaction is regulated to produce the greatest profit for the merchant. As a result, crop selection is the primary means by which smallholders can maximize the cash return on their yields.

The Egyptian farmers are confronted with the difficult choice of selecting food and/or cash crops in particular proportions. El Kassas "believes that farmers should plant cash crops because they can then buy more food than they could grow. The issue of food dependence is not as critical for El Kassas as current availability. In contrast to the Egyptian perspective of Professor El Kassas, Weiskel,[13] a Western anthropologist, strongly suggests that African nations should return to food production and reduce their dependence on Western agricultural surpluses. Both El Kassas and Weiskel have valid positions. They are caught in the dilemma of weighing short-term needs for food, shelter and fuel against the long-term desires for economic stability and environmental improvement. Weiskel himself recognizes that, "This is a syndrome of closely related social, economic and ecological phenomena which combine to cause a self-perpetuating cycle of environmental

decline."[46] As in any cycle, it is difficult to identify a point at which to introduce counteractive measures. The consequence is too often a form of social and/or political displacement activity.

DESERT DEVELOPMENT

Thirty per cent of the earth's surface is arid or semi-arid and is collectively referred to as desert. In reality, such regions are very diverse in topography, parent material, climate, availability of water, and additional features.[47] For example, American University in Cairo's Desert Development Center (DDC) operates two experimental sites in the same geographical area with soil properties that are clearly distinguishable from one another. The soil at Sadat City tends to be calcareous, sandy in texture with a compacted surface layer covered by desert pavement. Variations in the soils of this site are attributed to differing levels of salinity, which tends to be high. In contrast, the soil at South Tahrir is very coarse with no clay fraction and having low to medium salinity. The two sites share the features of low organic content and a low supply of most nutrients. Any effort to develop the agricultural potential of these areas must accommodate the uniqueness of each environment. "To improve soil management and enhance soil development under desert conditions, it is imperative to identify the soil factors which limit productivity at the two desert sites."[48] Consequently, the first prerequisite for desert development is a complete analysis of the conditions under which the program will operate. Baseline data of this type are essential for meeting DDC's primary goal of treating the desert as a desert rather than importing loam-like soils from other regions.

Thomas[29] notes that, "Sustainable development calls for a multi-disciplinary approach and integrated systems analysis - a better understanding of both economic and ecological systems." The reference to "ecological systems" in this context includes social as well as biological and physical factors since Egyptian cultural values and beliefs are salient variables in any effort to establish and maintain a new desert community. It is, therefore, by necessity that Dr. Adli Bishay, founder and director of the DDC, has assembled a research team that is capable of addressing the issues of: housing, renewable energy, marketing, and public relations, as well as agriculture.

The multiple accomplishments of the DDC, and other research agencies, have clearly demonstrated that it is possible to produce food in desert environments. Despite the positive potential, the rate of desert development has been extremely slow, given the need for dispersing Egypt's human population and the country's state of food dependence. As one might suspect, there are multiple reasons for the lack of progress beyond the experimental level. A listing of contributing factors would include: conflict between the administrative personalities of various agencies; the quagmire of Egyptian bureaucaracy; and a lack of public advocacy. As one might guess, the primary deterrent is lack of adequate funding. Feasibility is one thing, cost effectiveness in quite another. Goueli[30] reports that the cost of reclaiming a fedden of land in the 1960s was L.E. 350 while the current costs will range from L.E. 3,000 to L.E. 10,000. Part of the increses is due to inflation, but equally important are the complicating features of Egypt's topography. Low, level land that could easily utilize surface irrigation was the first to be developed. The lands currently available are of such an elevation that the water

for irrigating fields would have to pumped to a height of 20-40 meters. Primary construction, the maintenance of the system, and a supply of energy to assure a constant flow of water accelerate the costs of desert development.

The volume of water necessary to meet Egypt's current needs, as well as any increased demands resulting from desert development, is at risk. Boutros Ghali,[31] Egypt's minister of state for foreign affairs, has indicated that the next war in northeastern Africa will be over water not politics. Nine countries depend on the Nile watershed with Egypt being at the end of the flow. Egypt has established allocation rights with the Sudan, but approximately 80 percent of the water that flows into Lake Nasser comes from the Blue Nile, which originates in the highlands of Ethiopia. It is the intent of the Ethiopian government to divert water for irrigation purposes in order to increase it's own agricultural production.[32] If the developmental plan is successful, an estimated reduction of 5.4 billion cubic meters of water a year would have dire consequences for life in Egypt. Postel[33] suggests that Egypt may have to stop its production of water-intensive crops, such as cotton and sugar cane, in order to more effectively utilize existing water in growing food. The potential water crisis is simply one more in a series of issues that complicates Egypt's productive capacity.

Although appropriate physical features are essential for a sustained desert community, they are of little value unless there are people to operate the systems. Sadat City, for example, is a newly constructed, planned city that is located approximately half way between Cairo and Alexandria and adjacent to a four-lane, blacktopped highway. There are currently 61 companies located in the city's

industrial park. Taking into consideration the "corridor effect," as well as the positive features of new, clean, well spaced housing, gainful employment and a quiet environment, one would expect this city to be a haven for those living in less desirable urban conditions. Unfortunately, Egyptians don't want to live there. Forrester[34] warned that to overlook the social factors in favor of the physical features of development can lead to the belief that technology will circumvent the social issues. Sadat City is a empty monument to the fallacy of such a narrow perspective.

From March 1986 to March 1987, the Desert Community Unit of the DDC conducted a study of the socio-economic aspects of the South Tahrar community. The findings of this study were consistent with the conclusions derived from previous surveys. Whether graduate farmer, smallholder or cooperative farmer, the informants were in agreement that their main problems, within the choices presented to them, centered around a link between the government's unfair payment system and the unannounced, frequent cut-offs of electricity which prohibits the delivery of pumped water to the fields.

Secondary and college graduates can obtain 20 to 30 feddan farms. These farmers are confronted with a number of serious problems in addition to those resulting from the government's operating procedures. There is a serious lack of operating capital, difficulties in marketing and a lack of infrastructure that would attract families to the area.[35] Sukkary-Stoiba[36] research also indicates that the, "... graduates' wives failed to rise above their Egyptian middle-class values against manual and domestic labor and consequently deprived themselves of the chance for success in Tahaddi." Repeated efforts to successfully establish new desert communities have made it clear that

development teams must include sociologists as well as agronomists.

HYDROPONICS

An Iowan's perspective of soil development is likely to involve images of accumulating nutrients and biomass until an approximation of loam is achieved. Such a process is possible given the luxury of time; but when the goal is an immediate increase in food production, alternative processes must be seriously considered. Hydroponics, for example, is a procedure whereby plants are grown in a nutrient solution rather than soil. Early experiments involved producing tomatoes, in a jar of liquid medium, without the presence of any soil-like base. More recently, the DDC has built shelters in which rows of plastic-lined furrows, containing gravel and a flow of nutrient solution, are used to produce quantities of vegetables. In such an arrangement, the gravel serves simply to anchor plant roots. It is apparent that hydroponics can be used in any environment containing appropriate levels of light and heat. At the Sadat City site, solar pumping is used to recycle the nutrient solution thereby avoiding dependence on unreliable government generated electricity. There are, however, limitations to substituting hydroponics for field cropping.

A critic of the DDC asked, "Who is going to pay LE 6 for a cucumber?" The question was his way of challenging the cost/effectiveness of the DDC's nutrient film technique (a hydroponic process). The critic represents those who share a misconception of the Centers function. The DDC generates protocols that have potential for mass production, but at this time, it is not a major production facility. If, and when, full scale hydroponic operations occur, the cost of produce will decline. Because of capital outlay, and the level

of technical skill required to establish and maintain the system, hydroponics is most likely to become cost/effective when utilized in "factory farms" where the current smallholder would function as an employee rather than a free agent. A food production corporation would be able to cut input costs through volume buying, the control of supply systems, and professional marketing. Such a concept is antithetical to the value and romance attached to small, independent, family farms. However, if one is pragmatic about human survival in Egypt, common sense dictates the establishment of noncompeting parallel systems of conventional farming and large scale corporate hydroponics. If the mass production of food via hydroponics is retarded it will be due to the lack of capital investment and/or government intervention rather than technological capability.

"Good science" takes time, energy and money. It requires painstaking analysis and evaluation of multiple variables so that the potentially devasting effects of projects such as the High Dam can be avoided. New and better ways of accomplishing a task are being developed at the same time current processes and products are operationally improved. For example, Dr. Assabghy, director of DDC's nutrient film project, and his research team are developing a new physical arrangement, the pyramid technique, that promises to be more productive and cost/effective than the current furrow process. Housing for the pyramid project was under construction during the summer of 1989. The new technique appears to be an impressive advancement in hydroponics. If this new physical arrangement meets projected expectations, the outcomes could result in a restructuring of the DDC's priorities.

STATE CAPITALISM

The role of a central government is a perplexing issue that must be addressed by every new or reformed nation. A primary concern is the ratio between responsibility and rights. The more responsibility government is given for the welfare of its citizens, the more rights it must have to exercise those responsibilities. This is why Adam Smith declared, "That government is best which governs least." A strong central government is considered the main threat to personal liberties because of its authority to control human rights. One would think that a nation which recently shed its colonial status would be particularly concerned with personal freedoms. However, national governments that were formed during the post-Second World War period, particularly in Africa, tend to have a strong centralized organization. There has, consequently, emerged a general pattern of political, economic and social structure among "Third World" countries that has come to be known as "state capitalism."

Cooper,[57] has identified a number of features characteristic of state capitalism:

(1) There is a inadequate national economy with a weak and disorganized middle and lower class.

(2) The state reorganizes economic resources by expanding social services, agrarian reform, nationalization of basic industries and the central control of finance.

(3) Government fails to transform the fundamental structure of society and is, therefore, quite unstable.

(4) The power elite maintains its status through bureaucratic procedures.

The current generation of state capitalism in Egypt was initiated by the Revolutionary Council in 1952-53 when it appointed politicaly trustworthy army officers to government positions for which they lacked experience. The appointment of government leaders based on loyalty rather than competence has led to an ever-increasing bureaucracy, inefficiency and abuse of power.[38] Complexity and confusion within the central government is also increased by the absorption of college graduates into the system. Among Nasser's labor policies was the guarantee that all college graduates would be employed. Since there have been more graduates (every Egyptian is entitled to a free public education) than jobs, large numbers of graduates were placed at the bottom of government's bureaucratic ladder. President Mubarak's decision to stop using government as the "employer of last resort" may prevent government operations from getting any worse, but it adds to the ranks of the unemployed during a period when over 50 percent of the population is living below the poverty level.[39] The ranks of government employees may not be expanding but they are being maintained since public employees can not he fired from their jobs. The structure of government has led Ambassador Basheer to the conclusion that, "The battle is between productivity and Egyptian bureaucracy."[40]

The Egyptian government receives more foreign aid than it can utilize. There are several billion dollars in concessionary loans and grants waiting to be used by the central bureaucracy.[41] Understandably, donors are frustrated and unwilling to extend the availability of aid. Egypt has requested that funding be transferred to direct balance of payment support in the form of cash so that the international debt can be reduced. However, donors have chosen to convert financial aid to shipment in kind, principally food. This is

exactly the type of condition that encourages consumption and detracts from Egypts productive capacity.

Egypt is unique in its ability to grow long staple cotton of high quality. The world market is such that foreign buyers are willing to pay the increased price required by the government. Unfortunatley, government controls over cotton growers have resulted in a production decline. Farmers have chosen to convert cotton land to clover and other forms of fodder; since livestock production is not regulated by the state capitalism and yields a greater margin of profit for the farmer. Consequently, Egypt's current level of cotton production only accomodate half of the market demand.[42]

It is apparent to Western observers that any major improvements in Egypt's standard of living must begin with a change in the structure, priorities and operation of the central government.

SOCIAL CLASS and STATE POLICY

It was Gamal Nasser's intent to restructure Egyptian society and reduce the glaring inequities that separated social classes. However,

> The prerevolutionary social structure came to influence deeply the disposition of land and other benefits of reform. In the end, this social structure limited the growth in state strength and helped shape the nature of politics within the institutions of the state. Thus society transformed the state.[43]

An understanding of Egyptian state capitalism is, therefore, based on knowledge of the country's class structure. When the categories of ownership, control, income and access are used to identify structural characteristics; it becomes evident that Egyptian society is composed of four distinct classes.[44] The highest class is composed of private sector capitalist followed, in decending order, by, (2) bureaucrats and

top level industrialists, (3) public sector middle class and (4) dependent underclass.

Nasser's socialist policies had their greatest effect on the two lower classes. Subsistence needs of the dependent underclass have been met by manipulating the economy to maintain an extensive welfare system. Free public education and quarenteed employment also provided members of the lower class, particularly the rural, landless poor, with a means of upward mobility. However, an expansion of middle class membership in the public sector has led to social and economic stagnation. Public sector industrial workers, bureaucrats and professionals have been removed from the free market economy. Their wages are fixed at a level that is far below their status and earning capacity. Political unrest is most likely to occur within this group.

Top level bureaucrats and industrialists are able to prosper from their ability to control state programs and sell influence. The extent of self-interest within the country became obvious to the general public when profiteers took advantage of foreign investment opportunities provided by the 1973 "infittah" (open door) policy.[65] The opulent lifestyle of this group constantly reminds the lower half to the social strata that some Egyptians can profit from currupt activities and avoid accountabiilty.

Private sector capitalists, those critical to maintenance of state capitalism, are not restricted by the socialist policies that apply to the middle and lower classes. The government's double standard has, however, brought about desired economic gains. The "open door" to foreign investment resulted in a 15 percent growth in the private sector from 1979 to 1982.[66] Although the country as a whole benefited from the gains, the profits did not compensate for discrepancies

between the classes or the disregard for social justice.

The primary producers occupy the middle and dependent lower classes in which there is little opportunity to alter their lifestyles. They are locked into a government controlled economic system in which most must have at least two jobs in order to make a living wage. An increase in agricultural or manufacturing output is not likely to occur until this portion of the population has the same access to competition as members of the upper classes.

CONCLUSIONS

It would far too easy to place the blame for Egypt's population/food dilemma on an ineffective central government. There isn't much doubt that the structure and policies of the government need to be vastly improved. However, the general population seems to have placed the burden of the country's welfare entirely on the government without assuming much in the way of personal responsibility. It is as though the subservient behavioral pattern of colonialism has been maintained. An improvement in the quality of life within any country is likely to require "bottom-up" as well as "top-down" movements. The success of government programs to control population and increase agricultural productivity are dependent on the will of the people. Those directly effected by a government program must perceive "ownership" in its implementation, or it is likely to fail. Local populations need to communicate clearly and forcefully with the government rather than sabotaging unpopular policies.

Durning[9] has observed that traditional social structures (i.e., kinship and religious groups) have not met the needs of "at risk" populations. The nature and pace of change has required the formation

of new organizations. There has, consequently, been an increase in grassroot movements throughout the world. For example, Australia, like Egypt, has been faced with the problem of salinization. However, the government in Melbourne believes the people's knowledge and understanding of the problem is just as important as technological solutions.[6] Because the soil is waterlogged, trees are planted to absorb groundwater and allow rain to wash accumulated surface salt to lower strata. The Girl Guides, along with others, have planted over a million trees. "A major component of the public awareness campaign puts responsibility for preventing salinization in the hand of the people. If the farmers realize that the government won't bail them out, they may stop using cheap but harmful land management practices ."[7]

The Austrailian example demonstrates that grassroot movements are most effective when they operate in concert with government programs. It is also clear that grassroot programs do not just happen. There must be planning, organization and leadership. The peasant population is likely to identify with one of their own, someone who will build from the existing social structures rather than imposing an alien system.

It is apparent, from a Western perspective, that the Egyptian government's policy of aversive control needs to be replaced with educational programs and monetary incentives that will allow farmers to make intelligent choices and operate in the "free market place." The Suez Canal University has recently established such a program for the education and training of agricultural engineers, extension officers and farm managers at it's El Arish campus. If the graduates of these programs are sociologically compatible with the fellahin, they could

provide leadership for village support systems that would directly benefit the entire community. However, there is also the possibility that such an agricultural support staff will simply become another layer in the existing bureaucratic structure.

Egyptian decision makers are faced with such difficult choices that after receiving a report of the country's economic status, President Mubarak is proported to have said, "By the prophet Mohammed, if they brought in a government of angels, it wouldn't make any difference.'[9] The process of improving the quality of life within Egypt is so complex that it seems like an unattainable task, but a fatalistic response will not solve the country's problems. There are also those whose faith in fate is so strong that they will say, "Egypt has existed for thousands of years, under all types of conditions. Logically it shouldn't exist today, but it does. It will also exist tomorrow." Perhaps, but the prognosis is bleak.

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